

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
15 August 2002 (15.08.2002)

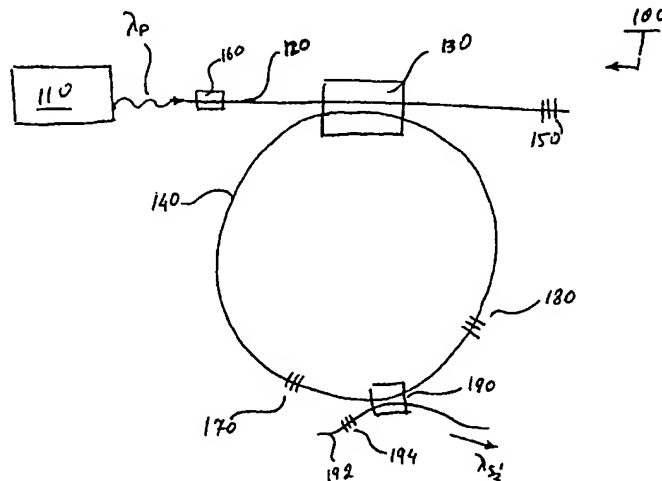
PCT

(10) International Publication Number
WO 02/063728 A3

- (51) International Patent Classification⁷: **H01S 3/30** (72) Inventors; and
(21) International Application Number: **PCT/US02/03894** (75) Inventors/Applicants (*for US only*): **PO, Hong** [US/US];
8 Town Lyne Road, Sherborn, MA 01770 (US). **DEMI-DOV, Andrey, A.** [RU/US]; 1110 Franklin Street,
Duxbury, MA 02332 (US).
(22) International Filing Date: 7 February 2002 (07.02.2002)
(25) Filing Language: English (74) Agent: **OCCHIUTI, Frank, R.**; Fish & Richardson P.C.,
225 Franklin Street, Boston, MA 02110-2804 (US).
(26) Publication Language: English (81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, I.C.,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VN, YU, ZA, ZM, ZW.
(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier applications:
US 60/267,252 (CON)
Filed on 7 February 2001 (07.02.2001)
US 09/ (CON)
Filed on 6 February 2002 (06.02.2002)
(71) Applicant (*for all designated States except US*): **LASER-SHARP CORPORATION** [US/US]; 86 South Street,
Hopkinton, MA 01748 (US).
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: **RAMAN FIBER LASER**



(57) Abstract: The invention features, for example, a system (100) including an energy source, (110) two fibers, (120)(1400 a WDM (130) and a fiber Bragg grating (180). The first fiber (120) is coupled (160) to the energy source (110) so that pump energy from the energy source can be transferred to the first fiber (120). The WDM (130) is capable of transferring the pump energy from the first fiber (120) to the second fiber (140). The fiber Bragg grating (180) is in the second fiber, (140) and is capable of substantially reflecting energy at a predetermined wavelength. The first fiber (120) is devoid of a fiber Bragg grating capable of substantially reflecting energy at a predetermined wavelength. The pump energy interacts with the material from which the fiber is made and as a result Raman stoke transitions occur within the fiber. This energy can be used, for example, to enhance the signal in an optical fiber.

WO 02/063728 A3



Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:

13 March 2003

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/03894

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01S 3/30

US CL : 372/3

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
U.S. : 372/3Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| X --- | US 5,323,404 A (GRUBB) 21 June 1994 (21.06.1994), column 6, line 51- column 7, line 30. | 1-5, 21-29. |
| Y | | 6-20 |
| Y | US 6,163,554 A (CHANG et al.) 19 December 2000 (19.12.2000), column 3, line 50- column 4, line 34. | 1-29 |
| A | US 6,163,396 A (WEBB) 19 December 2000 (19.12.2000), abstract. | 1-29 |
| Y,E | US 6,344,925 B1 (GRUBB et al.) 05 February 2002 (05.02.2002), column 6, line 13- column 8, line 33. | 1-29 |

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"B" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

16 May 2002 (16.05.2002)

Date of mailing of the international search report

31 JUL 2002

Name and mailing address of the ISA/US

Commissioner of Patents and Trademarks

Box PCT

Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

Paul Ip

Telephone No. 703-308-0956